

Viewpoint

Centre of Gravity Analysis of Planning and Prosecution of the Battle of Britain?

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Abstract: Centre of Gravity analysis, a concept first developed by the Prussian soldier-scholar Carl Von Clausewitz, has often vexed military planners and historians alike. Importantly, this acute lens has rarely been applied to the Battle of Britain (BoB). Consequently, this article explores the protagonists' preparations for war, their subsequent selection of the concept's component parts and how successful they were at prosecuting their different aims. It will demonstrate that whilst the *Luftwaffe* were acutely aware of the concept they struggled to apply their understanding because of, amongst other things, institutional indiscipline. Contrastingly, whilst the RAF were not slavish to lexicon they employed the doctrine quite successfully.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD.

Introduction

This paper reflects on how the Centre of Gravity (CoG) concept can be applied to both the RAF and *Luftwaffe's* planning and prosecution during the Battle of Britain (BoB). Firstly, it examines Clausewitz's CoG concept and outlines potential problems with some contemporary interpretations. In assessing planning and its impact on campaign prosecution the paper also examines those decisions undertaken during the inter-war years pertaining to force structures, capability and doctrine. Specifically, it focuses on the RAF's creation of an Integrated Air Defence System (IADS) and the *Luftwaffe's* own development. It is proposed these events impacted upon their subsequent planning, selection and targeting of CoGs during the battle. Whilst significant, the role of the Royal Navy (RN), Coastal and Bomber Command are not considered due to the requirement for brevity. Furthermore, whether this actually *was* a battle, or part of a broader German campaign, is polemic and therefore outside the essay's scope. For convenience, the hostilities over the period 10th July – 31st October 1940 are referred to as the BoB.¹

The essay's thesis is that Britain faced an existential threat in 1940 which manifested itself in a clearly defined end-state.² Principally, Britain wanted to deter any German invasion whilst concurrently seeking to involve the United States in the war as it sought to benefit from their wealth and productive capacity in defeating Hitler.³ Consequently, the acuity of those objectives meant it was relatively simplistic for the RAF to identify the Critical Vulnerabilities (CV) for resisting German aggression. The RAF concentrated force against the *Luftwaffe*, whilst protecting its CVs, Critical Capabilities (CCs) and Critical Requirements (CRs) to deny them air superiority.⁴ But, it is suggested this was only possible because it had planned effectively during the inter-war years. Contrastingly, Germany's leadership failed to establish any definitive end-state prior to, or during, the campaign and this subsequently affected the *Luftwaffe's* identification, selection and targeting of CoGs. It was also hindered by strategic dithering, indecisive leadership, a highly questionable assessment of Fighter Command's (FC) capabilities and poor planning, during the inter-war years, for conducting air operations at reach. The aggregation of these failures undermined their campaign prosecution against selected CoGs resulting in a failure to achieve air superiority. The article summarises that CoG analysis offers utility in assessing historical case studies like the BoB, but each situation's context remains important due to classical and contemporary interpretations of the concept varying. When applied retrospectively the CoG concept offers real utility, but it should also be interpreted judiciously.

Contemporary doctrine defines CoG as: 'Characteristics, capabilities or localities from which a nation, an alliance, military force or other grouping derives its freedom of action, physical strength or will to fight'.⁵ A further distinction is made with Allied Joint Publication (AJP)-5 proposing actors possess 'strategic' and 'operational-level' CoGs. Typically, strategic CoGs pertain to dominant elements of power in a political system or 'will of the people' whilst operational-level CoGs relate to the capabilities permitting the entity to pursue operational objectives.⁶ The fabled soldier-scholar Carl Von Clausewitz defined CoGs more holistically focussing on

the enemy's systems and strength; he adopted more of an effects-based approach. His CoG concept, cited over fifty times in *On War*, advocates the concentration of effort against the *centripetal force*: 'Out of these characteristics a certain CoG develops, the hub of all power and movement, on which everything depends.'⁷ Interestingly, doctrine does not recognise the existence of 'tactical-level' CoGs even though Clausewitz made no distinction between differing levels of war. This may be a contemporary limitation as whilst the term intuitively feels misleading – for the tactical level of warfare – the concept remains valid.⁸

In AJP-5, operational-level CoGs possess a capabilities-based focus that is not overly conducive to retrospective application when protagonists were seeking a desired 'effect'. Some observers assert the military instrument has consistently misunderstood the CoG concept or, have distorted it to fit their favoured capabilities-based approach: 'Airpower theorists like John Warden, with his notion of 'concentric rings' have in fact identified so many CoGs as to reduce the concept to absurdity.'⁹ Contrastingly, Barley contends Clausewitz merely provided the concept's principles and offered little advice on how to achieve the desired end-state.¹⁰ Regardless of the conceptual issues arising from its abstract nature it is clear the *Luftwaffe* and RAF were both cognisant of CoGs,¹¹ even if they did not utilise contemporary lexicon.¹²

This article examines operational-level CoGs because they provide a better opportunity to elucidate an understanding of the concept. Utilising strategic-level CoGs from 1940 prevents them from being explored in sufficient depth as the doctrinal definition would likely result in the 'will of the peoples' or 'power of the regime' being selected.¹³ Employing AJP-5's nomenclature and seeking to achieve suitable balance in exploring the concept the article explores the RAF's protection of CCs, CRs and CVs and contrasts this with the *Luftwaffe's* selection and prosecution of CoGs.¹⁴

The Inter-war years - Britain

Britain's planners were exercised by air power's relatively nascent capabilities and assessed that it presented both opportunities and threats; the 'threat' had been realised in Britain during 1917 when Gothas killed 92 in raids upon Folkestone.¹⁵ This bombardment exposed the British populace to the realities of conflict and provided politicians with the sobering realisation that they were now required to defend attacks from the 3rd dimension – the air. Paradoxically, after the Treaty of Versailles the British Government reduced the RAF's personnel and equipment with stark alacrity. But, in 1919 a white paper conceived by Air Chief Marshal Trenchard was presented to parliament proposing how the RAF could be moulded into a deterrent against war;¹⁶ this reflected an emergent and institutional understanding, by the Royal Air Force's leadership, of the nation's CC/CV/CRs to air attack. Significantly, Trenchard's proposed force construct provided the foundation of any future requirement to be suitably expanded and his foresight and administrative acumen were highly impressive. Consequently, in 1936 with the spectre of Nazi Germany looming large the RAF were required to turn to a rapid expansion programme. Notably, it was Trenchard's sixteen-year-old, but prescient proposal, that was the basis for the Service's development.¹⁷

Trenchard's maxim was that 'the bomber would always get through' – employing air power to strike at the enemy's centripetal force.¹⁸ Consequently, initial RAF doctrine coalesced around the bomber more than its corollary - the fighter. Seemingly, this logic was adopted by former Prime Minister Baldwin who, in 1932, communicated a stark warning to Britons: '... there is no power on earth that can protect him from bombing, whatever people may tell him. The bomber will always get through.'¹⁹ Air defence it transpires had become a political issue and as a consequence early air power thinking witnessed an emphasis on aircraft production initially favouring the bomber. This was reflected in the Home Defence Force's (HDF) proposed composition: 'This force should comprise bombers as well as fighters – in fact, roughly two bombers to every fighter, since in the prevailing conditions of the time counter-attack was considered the prime element in defence.'²⁰

Elements of the Air Ministry and RAF leadership had however remained cognisant of the nation's vulnerability to air attack and had consequently been developing an IADS. The technology's progress, in the form of a Chain Home (CH) radar system, produced sufficiently promising results in air exercises, during 1937, to expand the system with funding identified for 20 transmitter-receiver stations.²¹ This planning, allied with the enhanced fighters and utility of the Royal Observer Corps, would later form the foundation of the RAF's fabled 'Dowding System'. It was however, 1934 that was the landmark year for Britain's re-armament planning as fears had become heightened as a consequence of Hitler's earlier accession as Chancellor, Japan's departure from the League of Nations, Germany's premature exit from the Disarmament Conference and the sobering realisation that Germany had actually been covertly developing an air force.²² Cumulatively, these events resulted in the approval of a plan to expand the RAF – Expansion Scheme A; part of which was the 1936 creation of FC to coordinate and control the UK's air-defence assets under the stewardship of Air Chief Marshal Dowding. This development was integral to FC's BoB success as it provided the unity of command²³ required to concentrate finite resource against its enemy and by so doing minimised inefficiency.²⁴ The *Luftwaffe's* 1937 'terror-bombing' of Guernica only reaffirmed this determination to establish a robust IADS in Britain. Consequently, Dowding lobbied ministers successfully to rebalance the emphasis towards high-performance fighters (an obvious CR): '... there was a fundamental shift in the balance of aircraft production in the late 1930s.'²⁵ Belatedly, the nation's IADS was beginning to take shape.

The inter-war years - Germany

The Treaty of Versailles actually prevented Germany from possessing an air force, but undeterred they covertly began developing the *Luftwaffe's* foundations in the 1920s using civilian aviation, sports and gliding clubs as covers for aircrew and aircraft development. Critically, they provided aircrew with elite military training in Lipetsk, Russia, under a bi-lateral agreement between the *Weimar* and Moscow.²⁶ By 1932, hundreds of German aircrew had graduated from Lipetsk and numerous prototype aircraft had also been tested.²⁷ This initiative continued at a startling pace under Hitler and this productivity was matched by Germany's aircraft industry. For example, in 1933 the industry totalled 3,500 workers and produced just

31 aircraft per month. After tooling-up and significant expansion, predominantly using military funding, it became capable of producing an average of 164 monthly (in 1934) and 235 per month by 1935.²⁸ Whilst this expansion was prodigious the *Luftwaffe* also required doctrinal development in addition to its developing mass.

In the 1930s Germany's air doctrine was heavily reliant on Douhet's 1921 seminal work: *The Command of the Air*.²⁹ They determined that air power could directly attack the enemy's *centripetal force* undermining the populace's willingness to support the leadership if their morale, economy and armed forces were systematically targeted.³⁰ This Clausewitzian theme is reflected in the tenor and wording of *Luftwaffe* Regulation 16 (LR16). However, Walter Wever, its then Chief of Staff, also believed the *Luftwaffe* was a supporting service and should not pursue its own war:

...the *Luftwaffe* is to serve these goals by commanding the war in the air within the framework of combined operations. By battling the enemy air force, the enemy armed forces are weakened, at the same time, our own armed forces, our people, and homeland are protected.³¹

Wever's opinion was a slight disjuncture from LR16's doctrinal intent and this would have systemic implications for the *Luftwaffe's* inability to autonomously develop and prosecute a strategic air campaign in 1940. He did however possess a clear understanding of the technologies required for contemporary warfare including the development of long-range, four-engine bombers to prosecute CoGs.³² For example, Wever presented an official specification to industry for a bomber capable of carrying 'sizeable' ordnance to the North of Scotland and the Urals. And, had the Dornier19 or Ju89 prototypes been developed the *Luftwaffe* would, some contend, have possessed the world's first strategic bomber fleet.³³ After his early death however, the doctrinal and technological developments of the *Luftwaffe's* 'strategic capability' atrophied – somewhat serendipitously perhaps for Britain and the RAF. Later, as part of the *Condor Legion's* Spanish experience they predominantly developed Army-Land Integration tactics and lessons on the efficacy of strategic bombing, identified from attacking Guernica, were later ignored, or not sufficiently, developed during the BoB.³⁴ Consequently, in July 1940 regardless of its mass this essay's contention is the *Luftwaffe* was doctrinally deficient and possessed sub-optimal capabilities with which to conduct a strategic air campaign against FC; this is in part due to the lack of a clear strategy and sub-optimal planning processes.

The Battle of Britain

When *Blitzkrieg* descended upon France in 1940 it presented FC's leadership with a pivotal decision consequential to the outcome of the BoB. Fearful for France and the British Expeditionary Force, Churchill pressed Dowding to send additional fighters (CRs).³⁵ Whilst additional squadrons were eventually provided, Dowding argued strongly about meeting Churchill's request in total. This apparent obstinacy reflects his desire to preserve the fighters

for the looming BoB – they were essential for resisting the *Luftwaffe*.³⁶ Lorenz supports Dowding's rationale to resist this request by contending that FC was Britain's operational CoG and the aircraft industry and its IADS (including the fighters) were CVs and CRs respectively.³⁷ The identification of those elements that required force protection was comparatively straight-forward due to Britain's unequivocal end state – the avoidance of defeat as articulated in Churchill's 'finest hour' speech.³⁸ Again, this demonstrates that – contemporary lexicon aside – Britain was aware of and conducted some well-defined CoG analysis. Contrastingly, for Germany the end-state was less clear-cut even though for them the BoB would, it could be argued, determine the outcome of the war.³⁹

Hitler's preference for a quiescent Britain, enabling the *Wehrmacht* to turn East, was thwarted by Britain's continued rejection of diplomatic overtures. This would have implications for German plans to attack the Soviets and it became imperative the *Luftwaffe* avoided heavy attrition in any conflict over England. On 16 July, an exasperated Hitler issued Directive No.16 instructing the military make: '...preparations for, and if necessary to carry out, an invasion of England.'⁴⁰ It is unclear whether Hitler genuinely intended to invade or was attempting to coerce Britain into submission with a final show of force.⁴¹ For German planners however, Directive No.16 compounded matters somewhat as previously Hitler had informed Admiral Raeder, the *Kriegsmarine's* Commander-in-Chief, that his preference was for an economic blockade using naval and air power rather than a risky invasion.⁴² Of note, *Luftlotte2's* war-gaming, in May 1939, had determined it possessed insufficient means to conduct a long siege of Britain's sea lanes and war economy.⁴³ Moreover, the *Luftwaffe* would be constrained in prosecuting any such plan because Britain's Western ports were outside their aircraft's range – a legacy of earlier failures to develop the long-range strategic capabilities craved by Wever.⁴⁴

With little clarity emanating from the polity *Reichsmarshal* Göring compounded matters further still by offering little guidance to his commanders until late July 1940.⁴⁵ The *Luftwaffe* had seemingly established their initial objectives were to destroy the RAF, its supply system and damage the RN. And, by so doing achieve air superiority and establishing the foundations for an unmolested invasion before inclement autumnal weather.⁴⁶ Göring exacerbated his commanders' attempts of achieving synchronisation by separately tasking *Luflotte2* and *Luflotte3*, in July 1940, with devising plans for the air battle over England.⁴⁷ Additionally, after the battle had commenced he subsequently intervened to instruct them to target FC's airfields and aircraft industry (CRs) – tasks they had already been undertaking.⁴⁸ And significantly, his technological ignorance resulted in the issuing of orders not to attack the CH radar stations, that provided FC with invaluable early warning, after becoming frustrated with their lack of progress at disabling them.⁴⁹ This haphazard selection, and de-selection, of CoGs demonstrates fundamental failures in some key principles such as selection and maintaining the aim and concentrating force on selected targets. In their defence the absence of a cohesive plan was likely the consequence of the lack of an unequivocal end-state. Moreover, it could also reflect the *Luftwaffe's* doctrinal, leadership and experiential naivety having essentially been developed and utilised predominantly as a tactical air force.

Luflotte3's analysis determined the RN was the CoG reflecting the *Kriegsmarine's* concern about the RN's capabilities to defeat any invasion force. Therefore, for the *Luftwaffe* to destroy the RN it required air superiority which necessitated eliminating the RAF first.⁵⁰ But, it is also difficult to see how they had sufficient time available to defeat the RN during the operational window available. It follows, employing Barley's hypothesis, that FC and the RN were both CoGs that the *Luftwaffe* needed to address in sequential phases rather than being a binary choice of one over the other. Perilously, Hitler had left the prosecution of the air war to Göring who clearly lacked the acumen, administrative and technical skills for leading a modern air force. In reality, his inculcation of romantic amateurism into the senior echelons of the *Luftwaffe* created a leadership problem from which it never really recovered.⁵¹ At the campaign level Göring and his commanders also appear guilty of failing to ask themselves what had changed, during the BoB, and importantly whether their tactics were achieving the desired effect. For example, the *Luftwaffe's* assessment of FC's strength was also integral to campaign planning and should therefore feature in any assessment of their campaign prosecution.

Fatefully the *Luftwaffe* underestimated FC's strength in July 1940 by some considerable margin; believing that FC possessed only 200 fighters when the real figure was 608.⁵² Hubristically, the Intelligence Cell also erroneously informed the leadership the Bf 109 was vastly superior to FC's aircraft. And, they confidently assessed Britain's aircraft industry was producing 180-300 fighters per month when the figure for July was actually 496.⁵³ It is also now clear that during the BoB the reliability of the intelligence the *Luftwaffe* processed was degraded by indulgent accounts by German pilots that were hubristically exaggerating their successes.⁵⁴ This resulted in the leadership believing the *Luftwaffe* was making greater progress in degrading FC than it actually was. Also, the targets selected by the Intelligence Cell were supposed to be constituent parts of FC, CVs or CRs, but were on occasions Coastal Command or Fleet Air Arm airfields. They were therefore, not contesting the *Luftwaffe* for air superiority over Britain and these missions must be considered as nugatory effort.⁵⁵ This is also symptomatic of the poor intelligence that commanders were presented with and from which they established their campaign plans upon.

An area where Hitler and Göring did provide their air commanders unequivocal guidance was the *Luftwaffe* was forbidden to drop bombs on London. However, over the 24/25th August German bombers unintentionally dropped ordnance on London, when targeting an aircraft factory in Rochester. It transpires they mistook the Thames for the Medway.⁵⁶ In retaliation, Britain's War Cabinet ordered that Bomber Command retaliate by bombing some of Germany's cities. In response, to the British retaliation the *Luftwaffe* received new orders to prosecute targets in England's capital and a new and distracting chapter of the campaign ensued. An enraged Goering also perceived, through erroneous intelligence, that FC was nearing its culmination point and Britain's generic resistance would wane after their attacks on London. He believed that FC was bound to defend London in force, enabling the *Luftwaffe* an opportunity to finally defeat FC in the air.⁵⁷ In reality, whilst seriously degraded FC still possessed more fighters, than the German's assessed, and by switching away from bombing

FC's airfields the *Luftwaffe* only afforded FC with an enforced operational pause from which they reconstituted quite successfully. Thereafter, FC stoically resisted and denied the *Luftwaffe* air superiority until the Autumn after which the previously incessant waves of German aircraft stopped visiting; German air superiority had been denied, invasion deterred and defeat or peace settlement avoided.

In summary, this article proffers the CoG concept does have utility, for both historians and practitioners, as a tool for understanding some of the planning and campaign prosecution during the BoB; even when applied retrospectively. It is clear the *Luftwaffe* were cognisant of the concept, but seemingly struggled to apply this understanding with any consistency or indeed discipline. Moreover, they failed to recognise that: 'A commander must know what his opponent's CoG is so he can efficiently plan ways to attack it through decisive points or vulnerabilities.'⁵⁸ Contrastingly, whilst the RAF did not employ the doctrinal lexicon they appeared to utilise the CoG assessment processes to identify their own CCs, CRs and CVs in pursuit of their end-state; they appeared cognisant of the threat and identified the means to protect themselves. Thereafter, FC defended these elements brilliantly and British planners were highly attuned of the requirement to maintain air superiority until the arrival of Autumn's inclement weather and by so doing deter Germany's potential invasion plans.

British air power thinking in the 1920s had coalesced around the bomber's role at striking CoGs. However, concerns about the nation's own vulnerability to air attack were exacerbated by Hitler's accession and the 1935 emergence, or to put it more accurately unveiling of the *Luftwaffe*. This realisation quickly provided the catalyst for Britain's hasty re-armament, expansion of the RAF and the investment in Dowding's IADS which ultimately served Britain so well. Essentially, the RAF: '... continuously developed air defence between the wars because strategic air defence was a political priority and because air defence had become institutionalised within the RAF.'⁵⁹ However, it could also be argued that this re-armament plan was executed only just in time as during the inter-war years the *Luftwaffe* grew in the dark. By 1940, it had acquired significant mass, but doctrinally and technologically was intended as a tactical air force in support of *Blitzkrieg*. After Wever's death any plans for a strategic offensive capability withered and the *Luftwaffe's* composition remained configured for Air-Land Integration operations. The *Luftwaffe* had not used this period as judiciously as Britain, but perhaps this was due to Hitler's end-state both before and during the BoB never being clearly articulated. Regardless, during the battle it was both ill-equipped and lacked the experience to plan and adequately prosecute a strategic air campaign.

Finally, the *Luftwaffe* was woefully led by Göring and to compound this he and his commanders processed, assimilated and acted upon poor intelligence that hindered their campaign prosecution. For example, having selected and prosecuted CoGs the leadership's decision to divert efforts away from its Offensive Counter-Air campaign on CoGs had a disastrous effect. Göring inadvertently provided FC with valuable respite at just the point where it had been experiencing considerable fatigue. It remains somewhat unclear if this was a visceral reaction

to the bombing of German cities or a desire for a great air battle over London. Regardless, when aligned with their at times inept planning it was terminal to their attempt at achieving air superiority.

Notes

- ¹ The Air Ministry offers these dates, but it is acknowledged there are alternatives.
- ² See AJP-5: 2-62 for an explanation on End-States.
- ³ The National Archives (TNA), War Cabinet Memorandum , COS Committee on UK seeking American Support, dated 3rd July 1940.
- ⁴ Air Superiority is defined in NATO's Glossary of Terms (AAP-6), 2013: 2-A-11.
- ⁵ AJP-5: Lex-6.
- ⁶ Ibid, 2-70.
- ⁷ Carl von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976): 596.
- ⁸ Oliver Lorenz, "The Battle of Britain: An Analysis in Terms of CoG, Culminating Point, Fog, Friction and the Stronger Form of War." *School of Advanced Military Studies*, (1989): 6.
- ⁹ Antulio Echeverria. "Clausewitz's Centre of Gravity: It's Not What We Thought." *Naval War College Review*. Vol1, No.1: 108.
- ¹⁰ M Barley, "Contributing to its Own Defeat: The Luftwaffe and the Battle of Britain." *Defence Studies*, 4:3, (2004): 394.
- ¹¹ CoG is discussed in relation to aerial warfare in *Luftwaffe Regulation 16* (Para 13).
- ¹² In TNA, Annex I, to COS Committee Report, dated 10 May 1940, "The Threat from Airborne and Seaborne Attack," identifies the RAF and RN as CoGs to prevent German invasion.
- ¹³ Barley, "Contributing to its Own Defeat": 401.
- ¹⁴ See AJP-5 for definitions of CCs, CVs and CRs: 3-20.
- ¹⁵ Stephen Bungay, *The Most Dangerous Enemy*. (London: Aurum Press, 2001): 55.
- ¹⁶ Derek Wood and Derek Dempster, *The Narrow Margin*. (Pen and Sword, 2003): 21.
- ¹⁷ Ibid, 21.
- ¹⁸ Patrick Bishop, *Battle of Britain: A Day-by-Day Chronicle*. (Oxford: ISIS, 2011): 24.
- ¹⁹ Stanley Baldwin, Hansard Online, 2017, accessed March 21, 2017, <http://hansard.millbanksystems.com/commons/1932/nov/10/international-affairs>.
- ²⁰ Richard Hough and Dennis Richards, *The Battle of Britain*. (London; Norton, 2005): 21.
- ²¹ Bungay, *The Most Dangerous Enemy*: 61.
- ²² Ibid, 25.
- ²³ COS Committee re-emphasised that Air Defence was the prime responsibility of C-in-C FC and the territorial organisation of Anti-Aircraft Command was placed under FC in 1940. See T James, *The Battle of Britain*. (London: Frank Cass, 2000): 11.
- ²⁴ Barley, "Contributing to its Own Defeat": 389.
- ²⁵ Ibid, 389.
- ²⁶ Wood and Dempster, *The Narrow Margin*: 5.
- ²⁷ Hough and Richards, *The Battle of Britain*: 31.
- ²⁸ Wood and Dempster, *The Narrow Margin*: 7.

- ²⁹ Klaus Maier, Horst Rohde, Bernd Stegeman and Hans Umbreit, "Germany and the Second World War: 1919-1939." *Air Power History* 44/4 (Winter 1997): 34.
- ³⁰ Ibid, 34.
- ³¹ LR16 in James Corum & Richard Muller, *The Luftwaffe's Way of War* (Baltimore: N&P, 1998): 118-157.
- ³² Wood and Dempster. *The Narrow Margin*: 8.
- ³³ Ibid, 8.
- ³⁴ Barley, "Contributing to its Own Defeat": 393.
- ³⁵ Hough and Richards, *The Battle of Britain*: 61.
- ³⁶ David Preston, "The Key to Victory: Fighter Command and the Tactical Air Reserves During the Battle of Britain." *Air Power History*, Volume 41:4, (1994): 26.
- ³⁷ Lorenz, "The Battle of Britain": 13.
- ³⁸ Winston Churchill, Hansard Online, 2017, accessed 21 March, 2017, <http://hansard.millbanksystems.com/commons/1940/jun/18/war-situation>.
- ³⁹ David Johnson, *The Battle of Britain: July – October 1940*. (USA: Combined Publishing): 17.
- ⁴⁰ Fuhrer Directive No.16. Fuhrer Directive No16, JSCSC Archive, April, 2017, Accessed April, 4: http://library/resources/EResources/JSCSCArchive/Sealion/CONF38_OKWdirectives_sealion.pdf.
- ⁴¹ Bungay, *The Most Dangerous Enemy*: 111.
- ⁴² James Holland, *The Battle of Britain: Five Months that Changed History, May – October 1940*. (London: Bantam Press, 2010): 177.
- ⁴³ Karl-Heinze Volker, *Dokumente und Dokumentarfotos zur Geschite der deutschen Luftwaffe*. (Stuttgart, 1968): 466.
- ⁴⁴ Johnson, *The Battle of Britain*. 369.
- ⁴⁵ Barley, "Contributing to its Own Defeat": 403.
- ⁴⁶ Ibid, 110.
- ⁴⁷ Horst Boog, "The Luftwaffe and the Battle of Britain," in Henry Probert and Sebastian Cox (Eds), *The Battle Rethought*. (UK: Airlife, 1991): 20.
- ⁴⁸ Holland, *The Battle of Britain*: 467.
- ⁴⁹ Ibid, 468.
- ⁵⁰ Barley, "Contributing to its Own Defeat": 393.
- ⁵¹ Bungay, *The Most Dangerous Enemy*: 38.
- ⁵² Ibid, 104.
- ⁵³ Ibid, 188.
- ⁵⁴ Hough and Richards, *The Battle of Britain*: 244.
- ⁵⁵ Holland, *The Battle of Britain*: 496.
- ⁵⁶ Ibid., 496.
- ⁵⁷ Ibid., 244.
- ⁵⁸ Lorenz, "The Battle of Britain": 9.
- ⁵⁹ John Alexander, "Despised and Neglected? British Fighter Defence, 1922-1940." *Air Power Review*, Vol 14, No.2, 2011: 162 – 181.

Books

Bishop, Patrick. *Battle of Britain: A Day-by-Day Chronicle*. Oxford: Isis, 2011.

Boog, Horst. "The Luftwaffe and the Battle of Britain," in *The Battle Rethought*, Ed. Henry Probert and Sebastian Cox. UK: Airlife, 1991.

Bungay, Stephen. *The Most Dangerous Enemy*. London: Aurum Press, 2001.

Corum, James and Muler, Richard. *The Luftwaffe's Way of War: German Air Force Doctrine 1911-1945*. (Baltimore: Nautical and Aviation, 1998).

Holland, James. *The Battle of Britain: Five Months that Changed History, May – October 1940*. London: Bantam Press, 2010.

Hough, Richard and Richards, Denis. *The Battle of Britain*. London: W.W. Norton, 2005.

James, T. *The Battle of Britain*. London: Frank Cass, 2000.

Johnson, David. *The Battle of Britain: July – October 1940*. USA: Combined Publishing.

Overy, Richard. *The Battle of Britain: The Myth and the Reality*. New York: W.W. Norton, 2001.

Wood, Derek and Dempster, Derek. *The Narrow Margin*. Barnsley: Pen and Sword, 2003.

Volker, Karl-Heinze. *Dokumente und Dokumentarfotos zur Geschite der deutschen Luftwaffe*, Stuttgart 1968.

von Clausewitz, Carl. *On War*, edited and translated by Michael Howard and Peter Paret Princeton, NJ: Princeton University Press, 1976.

Journals

Alexander, John. "Despised and Neglected? British Fighter Defence, 1922-1940." *Air Power Review*, Vol 14, No.2, (2011): 162 – 181.

Barley, M. "Contributing to its Own Defeat: The Luftwaffe and the Battle of Britain." *Defence Studies*, 4:3, (2004): 387-411.

Echeverria, Antulio. "Clausewitz's Centre of Gravity: It's Not What We Thought." *Naval War College Review*. Vol 1, No.1, (2003): 108-123.

Holland, James. "The Battle of Britain. The RUSI Journal, 155:4, (2010): 70-75.

Lorenz, Oliver. "The Battle of Britain: An Analysis in Terms of CoG, Culminating Point, Fog, Friction and the Stronger Form of War." *School of Advanced Military Studies*, May (1989): 1-44.

Lund, Earle. "The Battle of Britain: A German Perspective. Joint Doctrine Air Campaign Course. January 1996: 1- 54.

Maier, Klaus, Rohode, Horst, Bernd Stegeman and Umbreit, Hans, "Germany and the Second World War: 1919-1939." *Air Power History* 44/4, Winter (1997): 34.

David Preston, "The Key to Victory: Fighter Command and the Tactical Air Reserves During the Battle of Britain." *Air Power History*, Volume 41:4, (1994): 1-18.

Shields, John. "The Battle of Britain: A Not So Narrow Margin." *Air Power Review*, Summer (2015): 183-197.

Others

Allied Joint Doctrine for Operational Level Planning (AJP-5), (Defence Concepts and Doctrine Centre, 2013).

NATO, AAP-6: Glossary of Terms. (French and English). 2013.

Baldwin, Stanley. Hansard Online, March, 2017. Accessed March, 22:
<http://hansard.millbanksystems.com/commons/1932/nov/10/international-affairs>.

Churchill, Winston. Hansard Online, March, 2017. Accessed March, 23:
<http://hansard.millbanksystems.com/commons/1940/jun/18/war-situation>.

German Plans for the Invasion of England, 1940 (Operation SEALION).

OKW Directives for the Invasion of U.K. Operation SEELOWE: Summer and Autumn, 1940.

TNA. War Cabinet. Home Defence, dated 30th June, 1940.

TNA. War Cabinet. Imminence of a German Invasion of Great Britain: Report by the Joint Intelligence Sub-Committee, dated 4th July 1940.

TNA. War Cabinet. American Co-operation: Memorandum by the Chiefs of Staff Committee, dated 3rd July 1940.

Fuhrer Directive No16, JSCSC Archive, April, 2017, Accessed April, 4: http://library/resources/EResources/JSCSCArchive/Sealion/CONF38_OKWdirectives_sealion.pdf.

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